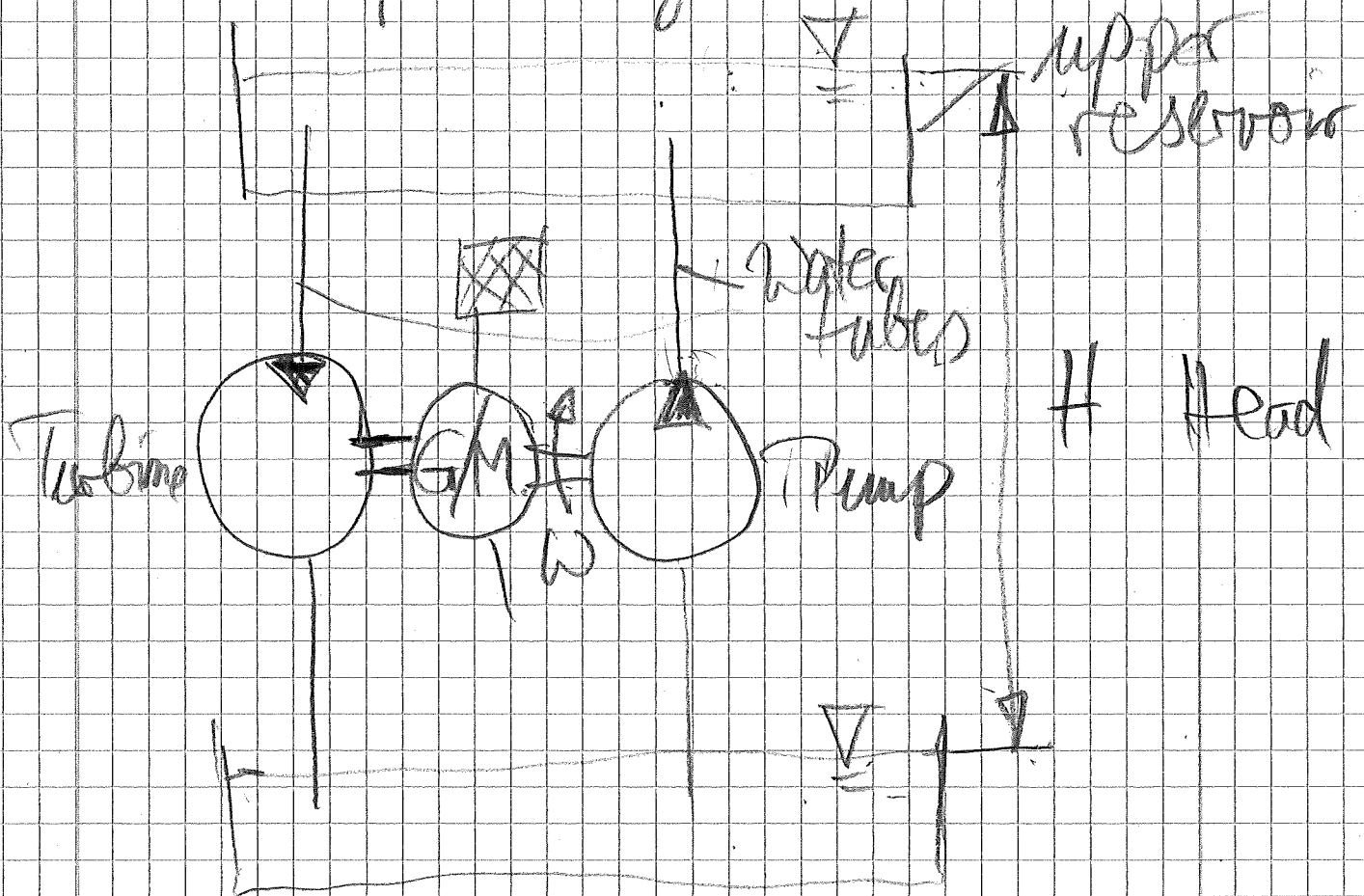


# Hydro Power

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## Pumped Storage Power Plant



## Physics

Energy potential  
(Head)  
kinetic  
pressure

## Potential Energy

$$E = H \times g \times \rho \times V$$

$$g = 9.81 \frac{\text{m}}{\text{s}^2}$$

$$\rho = 1000 \frac{\text{kg}}{\text{m}^3} \quad \text{Density of Water}$$

$V$  : Volume of reservoir

Example : Goldisthal  
(near Erfurt)

4 Pumps 257 MW each =  $P_p$

4 Turbines 269 MW each

2 Machine with variable speed

$$E = 8500 \text{ MWh}$$

Cycle Time

Pump mode

turbine mode

$$\frac{E}{4 \cdot P_p} = 8.3 \text{ h}$$

$$7.9 \text{ h}$$

$$\Sigma = 16.2 \text{ h}$$

Volume  $V = 12 \text{ Mio m}^3$

efficiency  $\eta = 0.8$

$$H = \frac{E}{\rho \cdot g \cdot V \cdot \eta}$$

8500 MWh

$$= \frac{10 \frac{\text{m}}{\text{s}^2} \cdot 1000 \frac{\text{kg}}{\text{m}^3} \cdot 12 \cdot 10^6 \text{ m}^3 \cdot 0.8}{8500 \text{ MWh}}$$

$= 312 \text{ m}$

